2000

OBSERVATIONS & RECOMMENDATIONS

After reviewing data collected from **HALFMOON POND** the program coordinators recommend the following actions.

FIGURE INTERPRETATION

- Figure 1: These graphs illustrate concentrations of chlorophyll-a in the water column. Algae are microscopic plants that are a natural part of lake ecosystems. Algae contain chlorophyll-a, a pigment necessary for photosynthesis. A measure of chlorophyll-a can indicate the abundance of algae in a lake. The historical data (the bottom graph) show a *slightly improving* in-lake chlorophyll-a trend, meaning concentrations are generally decreasing. Algal concentrations remain consistent with last season's results, and are still below the NH mean value. While algae are present in all lakes, an excess amount of any type is not welcomed. Concentrations can increase when there are external and internal sources of phosphorus, which is the nutrient algae depend upon for growth. It's important to continue the education process and keep residents aware of the sources of phosphorus and how it influences lake quality.

- Figure 2: Water clarity is measured by using a Secchi disk. Clarity, or transparency, can be influenced by such things as algae, sediments from erosion, and natural colors of the water. The graphs on this page show historical and current year data. The lower graph shows a *fairly stable* trend in lake transparency. The slight decrease in lake transparency this season might have been caused by increased nutrient runoff into the lake or an increase of particulate matter from watershed runoff. The mean clarity is again below the state mean. The 2000 sampling season was considered to be wet and, therefore, average transparency readings are expected to be slightly lower than last year's readings. Higher amounts of rainfall usually cause more eroding of sediments into the lake and streams, thus decreasing clarity.

- Figure 3: These figures show the amounts of phosphorus in the epilimnion (the upper layer in the lake) and the hypolimnion (the lower layer); the inset graphs show current year data. Phosphorus is the limiting nutrient for plants and algae in New Hampshire waters. Too much phosphorus in a lake can lead to increases in plant growth over time. These graphs show a *stable, but worsening since 1998,* trend in the upper layer, and a *stable* trend in the lower layer. Epilimnetic phosphorus concentrations were slightly elevated in June and July. Thunderstorms in June before sampling likely increased the amount of runoff from the watershed and caused the increase in phosphorus. A rain event might have also been responsible for the elevated July concentration. Hypolimnetic phosphorus concentration was elevated in July also and could have been caused by the turbidity of the sample, which indicated that there was possibly some bottom sediment contaminating the sample. The mean of both layers was just below the state median for phosphorus. One of the most important approaches to reducing phosphorus levels is educating the public. Humans introduce phosphorus to lakes by several means: fertilizing lawns, septic system failures, and detergents containing phosphates are just a few. Keeping the public aware of ways to reduce the input of phosphorus to lakes means less productivity in the lake. Contact the VLAP coordinator for tips on educating your lake residents or for ideas on testing your watershed for phosphorus inputs.

OTHER COMMENTS

- Dissolved oxygen was again high at all depths of the pond (Table 9), however it approached the critical level of 1.0 mg/L in the last meter of the pond in August. As oxygen is depleted below 1.0 mg/L, phosphorus normally bound to the sediments is released into the water column, a process that is referred to as *internal loading.* We should continue to monitor this process with continued sampling and scheduling the biologists visit in late summer.

- Conductivity (Table 6) and phosphorus (Table 8) decreased in West Inlet this season. Results for both parameters were similar to those seen in 1998. This suggests that sufficient rainfall increases the flushing rate of the Inlet, which helps to decrease the nutrient accumulation. The lower results are also indicative of changes that could be occurring in the watershed that are improving the water quality of the Inlet. As suggested last season, there may be changes in road maintenance practices on Route 31 that are responsible for the lower values. It would be useful to uncover the reasons for these improvements.

- *E. coli* originates in the intestines of warm-blooded animals (including humans) and is an indicator of associated and potentially harmful pathogens. Bacteria concentrations were extremely low at the Boat Launch and were well below the state standard of 406 counts per 100 mL for Class B surface waters (Table 12). If residents are concerned about septic system impacts, testing when the water table is high or after rains is best. Please consult the Other Monitoring Parameters section of the report for the current standards for *E. coli* in surface waters.

NOTES

- Monitor's Note (6/30/00): Thunderstorms the previous evening.

USEFUL RESOURCES

Bacteria in Surface Waters, WD-BB-14, NHDES Fact Sheet, (603) 271-3503 or www.state.nh.us

Answers to Common Lake Questions, NHDES-WSPCD-92-12, NHDES Booklet, (603) 271-3503.

Phosphorus in Lakes, WD-BB-20, NHDES Fact Sheet, (603) 271-3503 or www.state.nh.us

Lake Protection Tips: Some Do's and Don'ts for Maintaining Healthy Lakes, WD-BB-9, NHDES Fact Sheet, (603) 271-3503 or www.state.nh.us

What is a Watershed?, NH Lakes Association pamphlet, (603) 226-0299 or www.nhlakes.org

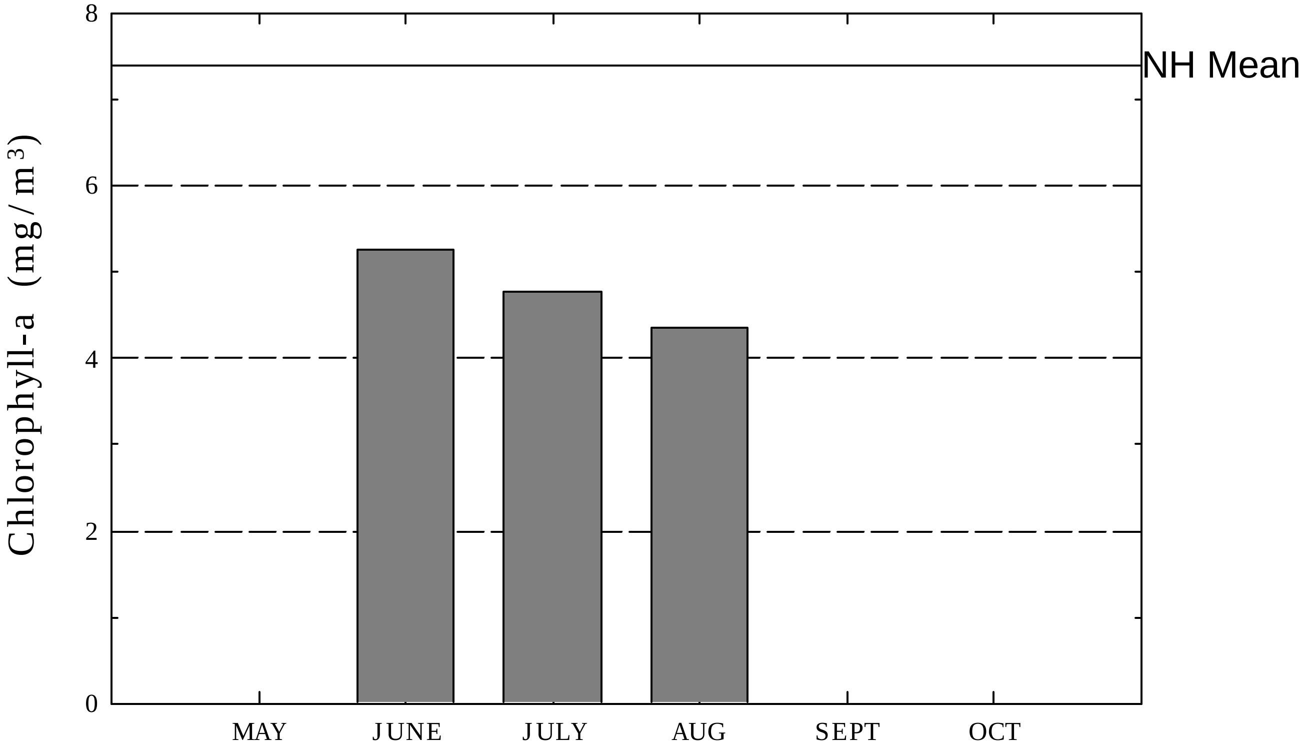
The Watershed Guide to Cleaner Rivers, Lakes, and Streams, Connecticut River Joint Commissions, 1995. (603) 826-4800

Freshwater Wetlands: A Guide to Common Indicator Plants of the Northeast. By Dennis Magee, Univ. of Massachusetts Press, 1981. (413) 545-0111, or www.umass.edu/umext/bookstore.html

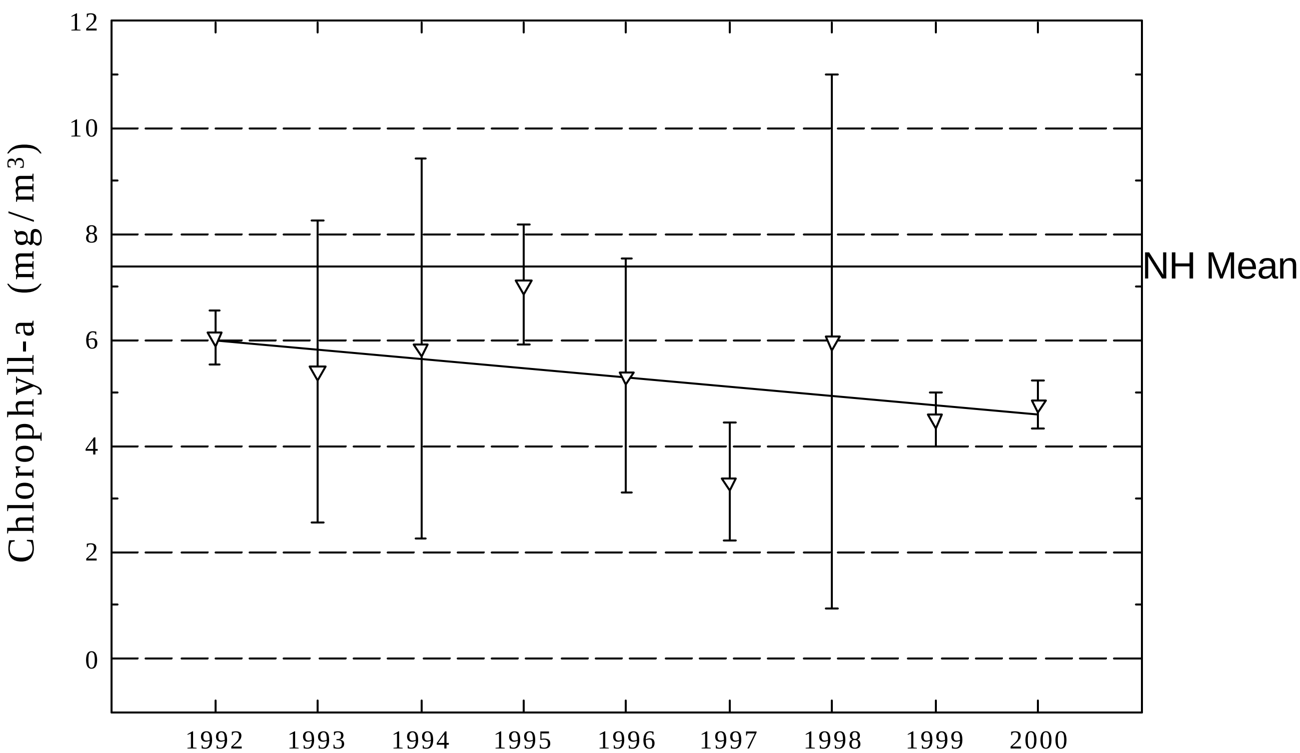
Weed Watchers: An Association to Halt the Spread of Exotic Aquatic Plants, WD-BB-4, NHDES Fact Sheet, (603) 271-3503 or www.state.nh.us

Halfmoon Pond

Figure 1. Monthly and Historical Chlorophyll-a Results



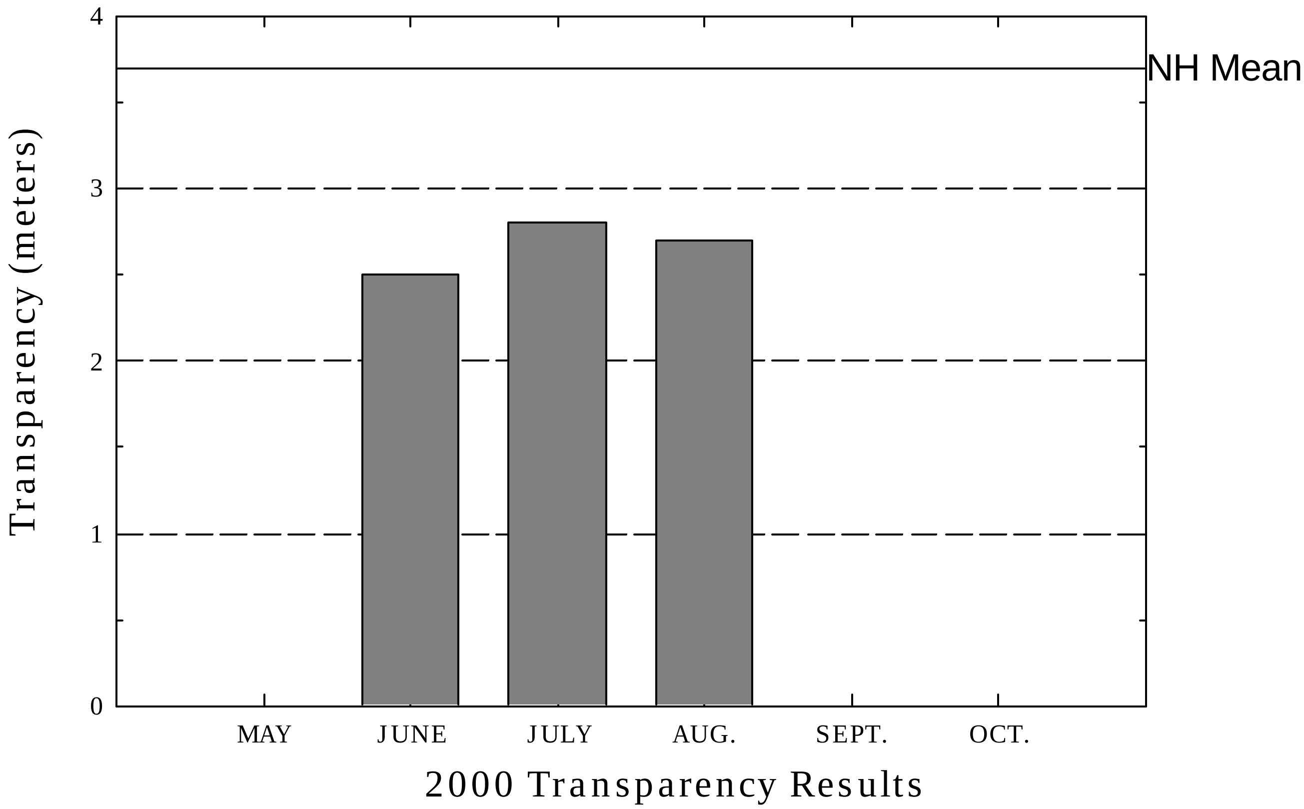
2000 Chlorophyll-a Results

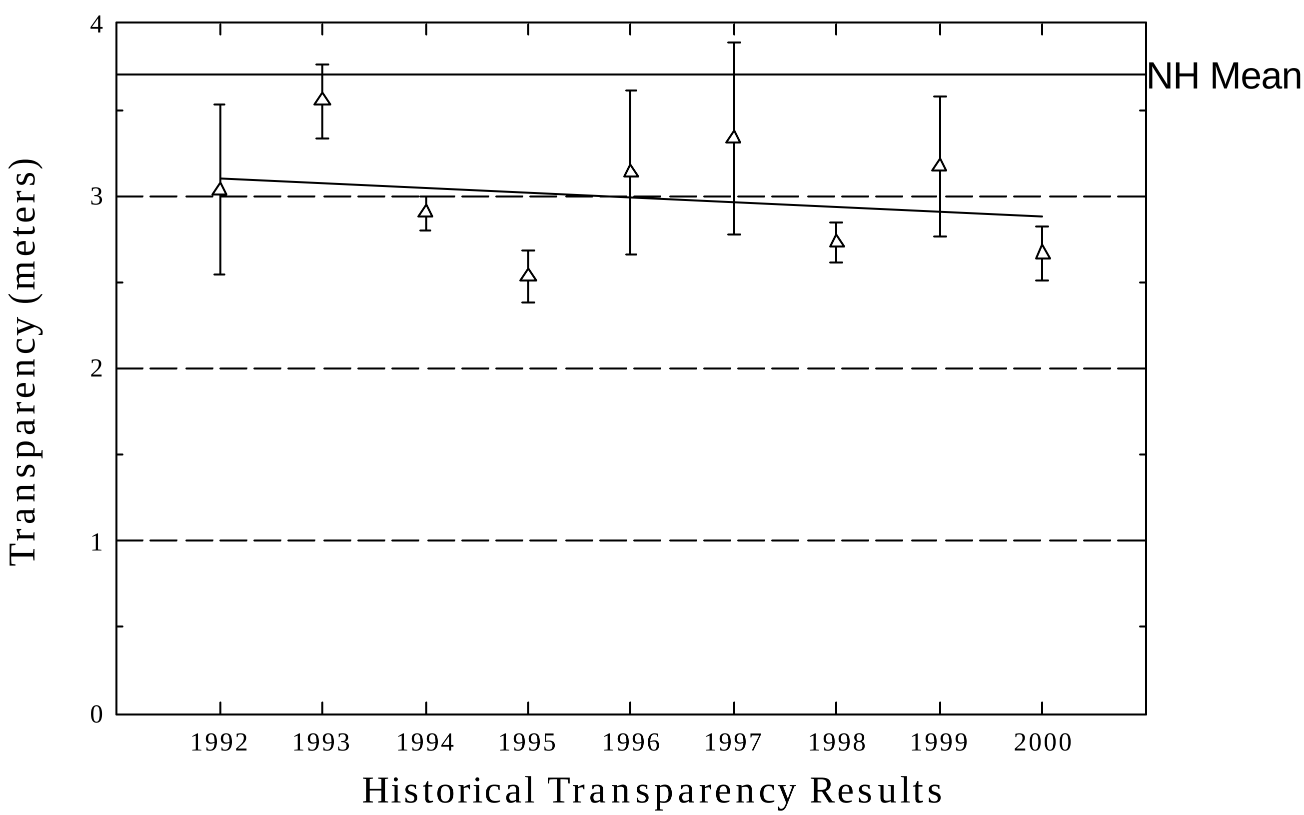


Historical Chlorophyll-a Results

Halfmoon Pond

Figure 2. Monthly and Historical Transparency Results





Halfmoon Pond

Figure 3. Monthly and Historical Total Phosphorus Data.

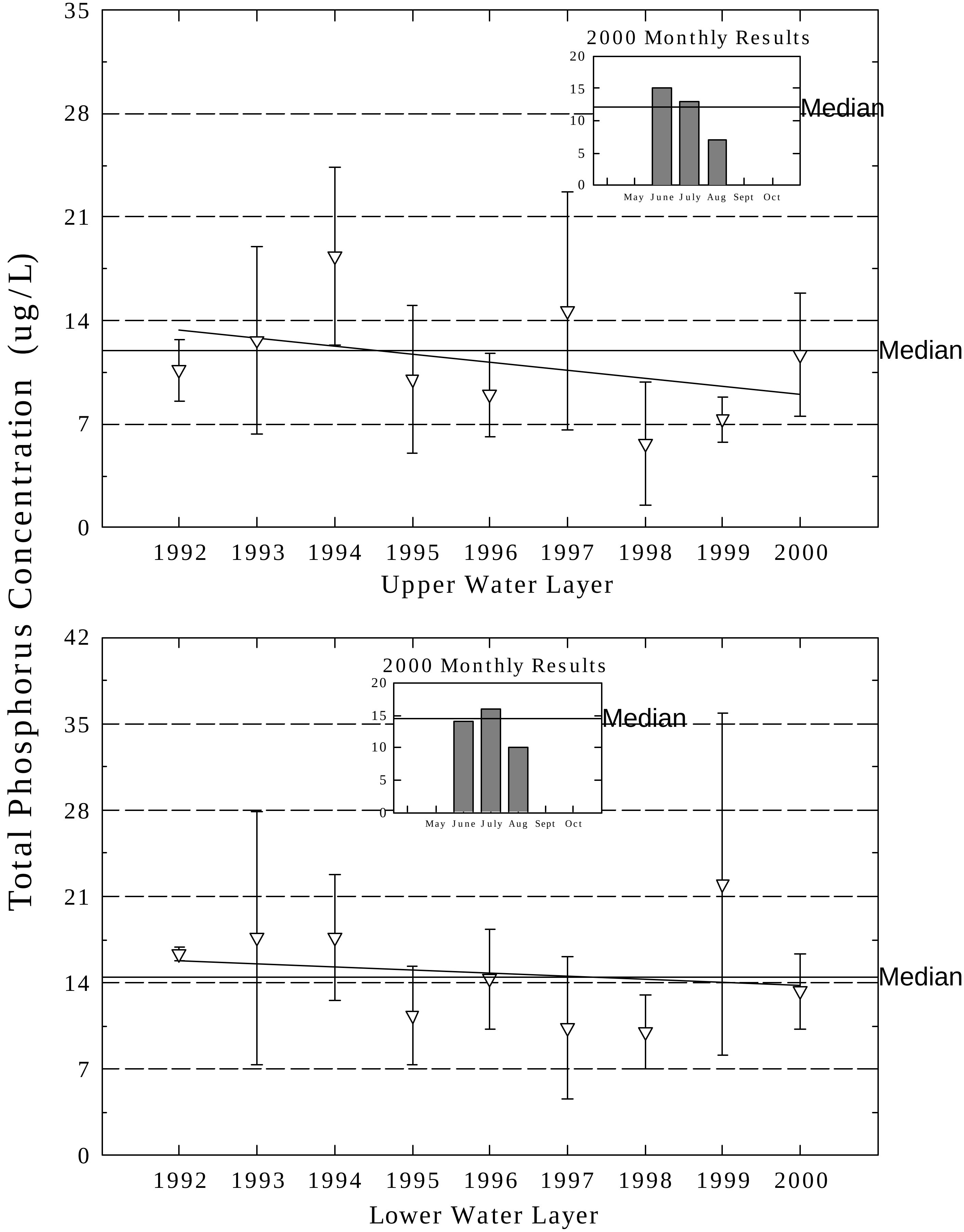


Table 1.

HALFMOON POND

WASHINGTON

Chlorophyll-a results (mg/m^3) for current year and historical sampling periods.

Year	Minimum	Maximum	Mean
1992	5.45	6.40	6.05
1993	3.11	8.58	5.41
1994	3.32	8.36	5.84
1995	6.23	7.84	7.03
1996	3.32	7.68	5.32
1997	2.04	4.01	3.32
1998	2.39	11.71	5.97
1999	4.03	5.05	4.49
2000	4.36	5.26	4.79

Table 2.

HALFMOON POND

WASHINGTON

Phytoplankton species and relative percent abundance.

Summary for current and historical sampling seasons.

Date of Sample	Species Observed	Relative % Abundance
06 / 16 / 1992	DINOBRYON	75
06 / 16 / 1993	DINOBRYON	38
	ASTERIONELLA	34
	MELOSIRA	16
06 / 23 / 1994	UROGLENOPSIS	69
	DINOBRYON	16
06 / 27 / 1995	SYNURA	49
	CHRYSOSPHAERELLA	38
	DINOBRYON	8
06 / 20 / 1996	MALLOMONAS	45
	DINOBRYON	18
	ASTERIONELLA	13
07 / 28 / 1997	DINOBRYON	76
	SYNURA	16
06 / 11 / 1998	MELOSIRA	75
	RHIZOSOLENIA	9
	UROGLENOPSIS	7
07 / 29 / 1999	DINOBRYON	29
	SYNURA	20
	RHIZOSOLENIA	15
08 / 28 / 2000	RHIZOSOLENIA	66
	TABELLARIA	12
	CHRYSOSPHAERELLA	10

Table 3.

HALFMOON POND

WASHINGTON

Summary of current and historical Secchi Disk transparency results (in meters).

Year	Minimum	Maximum	Mean
1992	2.7	3.6	3.0
1993	3.4	3.7	3.5
1994	2.8	3.0	2.9
1995	2.4	2.7	2.5
1996	2.6	3.5	3.1
1997	2.8	3.9	3.3
1998	2.6	2.8	2.7
1999	2.8	3.6	3.1
2000	2.5	2.8	2.6

Table 4.

HALFMOON POND
WASHINGTON

pH summary for current and historical sampling seasons.
Values in units, listed by station and year.

Station	Year	Minimum	Maximum	Mean
DAM OUTLET				
	1992	6.10	6.17	6.14
	1993	6.12	6.23	6.18
	1994	6.15	6.44	6.24
	1995	5.65	6.08	5.85
	1996	5.87	5.97	5.93
	1997	5.99	6.24	6.07
	1998	5.93	6.10	6.03
	1999	5.90	6.32	6.09
	2000	6.07	6.28	6.17
EPILIMNION				
	1992	6.10	6.22	6.17
	1993	6.32	6.41	6.35
	1994	6.08	6.48	6.28
	1995	5.90	6.54	6.18
	1996	5.69	6.25	5.90
	1997	6.11	6.45	6.30
	1998	6.15	6.59	6.26
	1999	6.29	6.33	6.31
	2000	6.56	7.16	6.79
HYPOLIMNION				
	1992	5.71	5.82	5.76
	1993	6.15	6.24	6.19
	1994	5.60	6.03	5.80
	1995	5.28	6.09	5.59

Table 4.

HALFMOON POND
WASHINGTON

pH summary for current and historical sampling seasons.
Values in units, listed by station and year.

Station	Year	Minimum	Maximum	Mean
	1996	4.94	5.76	5.29
	1997	5.95	6.24	6.10
	1998	5.49	6.14	5.76
	1999	5.63	5.91	5.72
	2000	5.79	5.89	5.83
METALIMNION				
	1992	5.96	6.17	6.08
NORTH INLET				
	1992	5.94	6.05	5.99
	1993	6.00	6.47	6.18
	1994	6.02	6.05	6.03
	1995	5.80	6.27	6.01
	1996	5.83	6.08	5.97
	1997	5.89	6.29	6.07
	1998	5.99	6.12	6.07
	1999	5.75	6.39	6.01
	2000	6.00	6.05	6.03
WEST INLET				
	1992	5.30	5.50	5.38
	1993	5.26	5.65	5.37
	1994	5.25	5.34	5.30
	1995	5.16	5.81	5.46
	1996	5.14	5.92	5.37
	1997	5.63	5.71	5.66
	1998	5.23	5.41	5.30

Table 4.

HALFMOON POND
WASHINGTON

pH summary for current and historical sampling seasons.
Values in units, listed by station and year.

Station	Year	Minimum	Maximum	Mean
	1999	5.65	6.42	5.83
	2000	5.10	5.58	5.31

Table 5.

HALFMOON POND

WASHINGTON

Summary of current and historical Acid Neutralizing Capacity.
Values expressed in mg/L as CaCO .

Epilimnetic Values

Year	Minimum	Maximum	Mean
1992	2.10	2.20	2.13
1993	0.50	2.20	1.63
1994	1.80	6.50	4.38
1995	1.60	3.10	2.47
1996	1.30	2.30	1.90
1997	0.50	2.20	1.60
1998	2.20	2.70	2.43
1999	2.30	2.50	2.43
2000	2.50	4.80	3.73

Table 6.

HALFMOON POND
WASHINGTON

Specific conductance results from current and historic sampling seasons. Results in uMhos/cm.

Station	Year	Minimum	Maximum	Mean
DAM OUTLET				
	1992	31.3	31.9	31.6
	1993	31.7	35.1	33.4
	1994	29.3	32.0	30.2
	1995	29.3	31.8	30.5
	1996	25.1	27.7	26.4
	1997	25.1	26.3	25.5
	1998	24.1	27.0	25.8
	1999	28.6	30.6	29.9
	2000	25.2	27.3	26.2
EPILIMNION				
	1992	31.7	32.0	31.9
	1993	31.7	34.7	33.5
	1994	29.5	31.7	30.0
	1995	29.0	31.9	30.6
	1996	26.2	27.1	26.5
	1997	25.1	26.1	25.7
	1998	22.4	27.1	25.4
	1999	29.4	29.8	29.5
	2000	26.6	32.1	28.9
HYPOLIMNION				
	1992	31.7	32.8	32.1
	1993	31.8	35.2	33.4
	1994	30.7	34.1	32.7
	1995	28.4	31.6	30.0

Table 6.

HALFMOON POND
WASHINGTON

Specific conductance results from current and historic sampling seasons. Results in uMhos/cm.

Station	Year	Minimum	Maximum	Mean
	1996	26.6	28.1	27.5
	1997	25.3	26.4	26.0
	1998	24.1	27.0	25.9
	1999	29.4	29.8	29.6
	2000	27.1	29.7	28.5
METALIMNION				
	1992	30.7	32.3	31.6
NORTH INLET				
	1992	24.5	27.3	25.8
	1993	24.2	33.6	28.1
	1994	24.5	26.2	25.2
	1995	24.8	27.2	25.6
	1996	22.0	26.7	23.7
	1997	22.2	24.7	23.1
	1998	21.1	28.2	23.7
	1999	24.3	28.8	26.6
	2000	20.2	21.9	20.8
WEST INLET				
	1992	103.1	122.0	114.1
	1993	106.2	134.2	120.7
	1994	87.7	101.1	96.6
	1995	74.5	83.9	79.1
	1996	66.7	76.7	72.3
	1997	88.7	97.1	92.2
	1998	75.4	91.4	84.5

Table 6.

HALFMOON POND

WASHINGTON

Specific conductance results from current and historic sampling seasons. Results in uMhos/cm.

Station	Year	Minimum	Maximum	Mean
	1999	80.6	96.4	89.1
	2000	74.2	87.0	82.6

Table 8.

HALFMOON POND
WASHINGTON

Summary historical and current sampling season Total Phosphorus data. Results in ug/L.

Station	Year	Minimum	Maximum	Mean
DAM OUTLET				
	1992	7	9	8
	1993	6	10	8
	1994	9	17	13
	1995	4	15	8
	1996	6	9	8
	1997	6	11	8
	1998	1	8	5
	1999	6	8	7
	2000	5	10	7
EPILIMNION				
	1992	9	13	10
	1993	9	20	12
	1994	12	24	18
	1995	5	15	10
	1996	7	25	14
	1997	7	23	14
	1998	1	9	5
	1999	6	9	7
	2000	7	15	11
HYPOLIMNION				
	1992	16	17	16
	1993	9	29	17
	1994	12	22	17
	1995	7	15	11

Table 8.

HALFMOON POND
WASHINGTON

Summary historical and current sampling season Total Phosphorus data. Results in ug/L.

Station	Year	Minimum	Maximum	Mean
	1996	10	18	14
	1997	7	17	10
	1998	7	13	10
	1999	14	38	22
	2000	10	16	13
METALIMNION				
	1992	9	14	11
NORTH INLET				
	1992	16	18	17
	1993	25	33	28
	1994	14	25	20
	1995	15	23	20
	1996	17	58	32
	1997	8	39	27
	1998	3	15	9
	1999	17	18	17
	2000	8	12	9
WEST INLET				
	1992	9	19	13
	1993	26	34	31
	1994	13	56	30
	1995	21	24	22
	1996	10	28	19
	1997	7	29	21
	1998	2	18	9

Table 8.

HALFMOON POND
WASHINGTON

Summary historical and current sampling season Total Phosphorus data. Results in ug/L.

Station	Year	Minimum	Maximum	Mean
	1999	19	34	26
	2000	9	17	11

Table 9.

HALFMOON POND
WASHINGTON

Current year dissolved oxygen and temperature data.

Depth (meters)	Temperature (celsius)	Dissolved Oxygen (mg/L)	Saturation (%)
	August 28, 2000		
0.1	21.3	7.8	87.9
1.0	21.1	7.8	88.0
2.0	20.6	7.8	86.3
3.0	17.7	5.4	56.6
4.0	16.3	1.7	17.6

Table 10.

HALFMOON POND

WASHINGTON

Historic Hypolimnetic dissolved oxygen and temperature data.

Date	Depth (meters)	Temperature (celsius)	Dissolved Oxygen (mg/L)	Saturation (%)
June 16, 1992	4.5	10.0	2.7	23.8
June 16, 1993	4.5	13.9	5.2	49.0
June 23, 1994	5.0	13.5	0.7	7.0
June 27, 1995	5.0	12.5	0.3	3.0
June 20, 1996	4.5	12.0	1.4	13.0
July 28, 1997	4.0	18.8	2.4	25.0
June 11, 1998	4.5	14.5	6.5	62.0
June 11, 1998	5.0	14.5	6.5	62.0
July 29, 1999	4.0	20.9	2.0	22.4
August 28, 2000	4.0	16.3	1.7	17.6

Table 11.

HALFMOON POND
WASHINGTON

Summary of current year and historic turbidity sampling.
Results in NTU's.

Station	Year	Minimum	Maximum	Mean
DAM OUTLET				
	1993	0.0	0.0	0.0
	1997	0.2	0.4	0.3
	1998	0.4	0.5	0.4
	1999	0.2	0.5	0.4
	2000	0.3	0.6	0.4
EPILIMNION				
	1993	0.0	0.0	0.0
	1997	0.4	0.6	0.5
	1998	0.4	1.4	0.8
	1999	0.4	1.0	0.6
	2000	0.4	0.7	0.5
HYPOLIMNION				
	1993	0.0	0.0	0.0
	1997	0.4	0.7	0.5
	1998	1.0	1.7	1.3
	1999	1.1	15.5	6.0
	2000	0.8	1.7	1.3
NORTH INLET				
	1993	0.0	0.0	0.0
	1997	0.6	1.2	0.8
	1998	0.4	0.8	0.6
	1999	0.7	1.0	0.8
	2000	0.4	0.6	0.5
WEST INLET				
	1993	0.0	0.0	0.0

Table 11.

HALFMOON POND

WASHINGTON

Summary of current year and historic turbidity sampling.
Results in NTU's.

Station	Year	Minimum	Maximum	Mean
	1997	0.6	1.2	0.8
	1998	0.3	1.0	0.6
	1999	1.0	1.6	1.3
	2000	0.3	0.6	0.4

Table 12.

HALFMOON POND

WASHINGTON

Summary of current year bacteria sampling.
Results in counts per 100ml.

Location	Date	E. Coli See Note Below
BOAT LAUNCH		
	August 28	1

NOTE: "<" means "less than" and ">" means "greater than"